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Enhancing the Impact of Online Simulations through Blended Learning: a Critical Incident Approach

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Introduction

Reflecting on events or experiences can be an effective way to promote learning. A critical incident is a significant occurrence that can stimulate learning through questioning what has happened and why. Critical incident analysis is concerned with reflecting on causes of events and their impacts. A series of incidents can be reflected upon in a debriefing setting using a structured approach to help to challenge people's assumptions and encourage learning. Although critical incidents can provide understanding about the nature and repercussions of discontinuities and events, there are a number of reasons why it can be difficult to learn from incidents in the real world. As such constraints do not exist in a simulated environment, online simulation games have the potential to provide an effective platform for the application of a critical incident method. Hence, by blending online simulation with critical incident led reflection, enhanced learning may be achieved.

Through presenting a case study of practice, the aim of this paper is to describe how critical incidents can be used within an online business simulation gaming exercise to benefit student learning. The objectives are to:

1. Consider the potential learning benefits of a critical incident approach within a simulated online learning environment
2. Describe a learning and assessment approach using a critical incident method within a business simulation game.

Following a review of literature relating to the use of the critical incident method and simulation games within education, this paper draws on a case study to outline a possible approach to combining both methods to benefit student learning. The paper concludes by considering both the limitations of the current study and areas for further research.

Background to Study

The critical incident technique, or method, was originated by Flanagan (1954). It was developed as a set of procedures for collecting direct observations of human behaviour to assess an individuals' performance in problem solving situations. It was initially used to help assess and classify the behavioural competence of US Air Force flying personnel. Since that time, the approach has evolved and has been applied to a range of different situations to help develop learning and understanding. Contexts within which the method has been used include customer service encounters (Kemppainen, 2000; Edvardsson and Roos, 2001; Roos, 2002), strategic innovation decisions (Moenaert et al, 2010), and entrepreneurial learning processes (Cope and Watts, 2000; Cope, 2003; Taylor and Thorpe, 2004). Critical incidents

have also been used for teaching and learning in higher education, often to help students to reflect on real workplace incident vignettes (Macfarlane, 2001; 2003) or business case studies (Gulezian, 1981).

The critical incident method has long been used to help people to reflect on their practice and develop new understandings of the processes they are engaged with (Finch, 2010). Critical incidents are often unplanned and unanticipated and perceived to have the potential to influence major change. The learning generated from more unusual events can often be transformational in that individuals, when faced with critical incidents, need to rethink their behaviours as their habitual ways can prove ineffective in the face of new conditions (Cope, 2003). Critical incidents provide a means for individuals to transform their learning from a lower-order and more routinised level, to a higher-order generative level.

Through applying the critical incident method, data can be gathered through a variety of structured or unstructured methods and researchers are given considerable latitude in study design. (Kemppainen, 2000). Flanagan (1954) originally advocated using interviews or observation. More recently, others have utilised more structured survey instruments (e.g. Johnston, 1995; Mallak et al, 2003; Voss, 2009) to unpack critical incidents with individuals. The predominant methods for critical incident analysis are via interview or focus group. Edvardsson and Roos, (2001) suggest developing an critical incident interview guide around the cause, course and result of a critical incident.

To understand how a critical incident method can be employed within an online simulated gaming environment to promote reflective learning, it is important to first understand the nature of simulation games and their role in providing experiential learning to participants (students).

There is quite an extensive literature dealing with how simulation games can be used as instructional tools to engage students with active learning (see Pasin and Giroux, 2011; and Sitzmann, 2011 for recent expositions of the simulation and gaming literature). Hainey et al (2011) illustrate the breadth and depth of disciplinary application of simulation gaming for learning from business through to medicine. Simulation games (SGs) are increasingly computer based and available online. They are highly complex synthetic artefacts where students are provided with the opportunity to 'learn by doing' through immersion in simulated versions of the real world (Ben-Zvi, 2010). In business education, many SGs are characterised by a simulated competitive environment within which rival companies make important strategic decisions. These decisions provide inputs into the software which in turn generates performance results and information which then form the basis for the next round of decision making (Vos and Brennan, 2011). Hence students see the impact of their business decisions played out over simulated time.

The benefits of employing business simulation games to help develop decision-making skills are well established (see Moizer et al, 2006; Edelman and Ueda, 2007; Gilgeous and D'Cruz, 1996). SGs can bring experiential learning into the classroom through providing structured environments for learning about complex problems (Doyle and Brown, 2000). Such learning is often deeper than that achieved when conventional teaching approaches are adopted, with the opportunity for learning to

occur at different levels in Bloom's taxonomy (Anderson and Lawton, 1988; Ben-Zvi, 2010) as well as allowing students to pass through all four phases of Kolb's 'experiential learning cycle' (Moizer et al, 2004). As well as being perceived by many students as an enjoyable way to learn, SGs do provide a means of integrating subject matter into the mainstream of students' interests through a blended approach to learning. A SG can be viewed as a 'learning laboratory' where students are able to practice analytical and decision-making techniques learnt in the classroom in preparation for the uncertainties of life (Gilgeous and D'Cruz, 1996). Experimentation can be undertaken at low cost and understanding of the nature of cause-and-effect can be promoted and developed, both under conditions of complexity and within compressed time periods. SGs can correspond with reality; but at the same time can provide safe environments for students to play out risks and live with 'synthetic' rather than real consequences, i.e. they easily allow learning through mistakes to occur. In the course of playing a SG, students also begin to attain a level of ownership which moves them from passive to active learners. Within the simulation setting, they are presented with opportunities to put the espoused theories that they have learnt into action, and actually try out new behaviours that they would not readily attempt in a workplace, often for fear of failure.

Interactive role-play is inherent to the simulation gaming experience. In business SGs, participants invariably assume prescribed roles of characters from a company;. This allows students to move towards developing an understanding of circumstances and roles that are beyond their immediate experience (Sutcliffe, 2002). They are given the opportunity to feel what is at stake, albeit in a synthetic setting. It is hoped that better understanding of roles and relationships, and a greater sense of self-awareness emerges from a SG role-play experience.

Though SGs provide a number of learning benefits, it should be noted that they are not 'self-teaching'. Rather, they are best employed as part of a blended learning approach that provides not only a theoretical foundation for the simulation, but also opportunities for post-simulation reflection. It is within this context that the potential for employing a critical incident approach emerges as means of enhancing the learning impact of online simulation.

Critical Incidents to Promote Learning in a Simulation Game

A review of the critical incident literature reveals various applications of the critical incident method, particularly as a means to allow individuals to reflect on their experiences and change their thinking. Therefore, it is perhaps surprising that there appears to have been very little research published in the domain of simulation gaming other than work by Wolfe (1975) who used Flanagan's critical incident technique to evaluate the behavioural effectiveness of students participating in a management SG. Simulation gaming would appear to represent a useful method to enable students to reflect on a series of simulated events and actions, and therefore, to deepen their understanding of judgement and decision making.

Critical incidents are a good medium for achieving reflective learning on the nature of situational events. However, there are a number of reasons why it can be difficult to

learn from incidents in the real world, and why therefore, simulation games may facilitate effective learning through the application of a critical incident method.

Firstly, in real environments critical incidents can be infrequent. Significant events may only occur over a period of months or even years. However, in a simulation game, a long period of simulated time can be compressed into a much shorter period of real playing time. For example, a number of simulated years can unfold in a matter of real hours. Hence, it is possible for a number of incidents to be introduced into the game by the instructor in a planned way, or to allow them to be generated in an unplanned way through the interactions and complex dynamics of the SG. Furthermore, the consequences of an event can be seen to emerge and develop in full over a simulated period of time. This allows the potential for rich learning opportunities to present themselves through critical incidents within a manageable period of play.

Secondly, not only do SGs offer the opportunity to compress real time into simulated time, they also offer the opportunity for instructors to stop time, and therefore ring-fence space for reflection, both forensically and in real time within a simulation gaming exercise. This is in contrast to the real world where day to day operational pressures invariably mean that managers have limited time to think about and learn from events that have unfolded. As a result, debriefing lends itself well to post-play critical reflection in a simulation gaming environment. In turn, such debriefing allows the learning benefits arising from in-play critical incidents to be harnessed more effectively. Assessment criteria based upon critical incidents can be introduced to require students to reflect on how an outcome was governed by a course of action, and what the causal influences were behind such an action or actions.

Thirdly, through technological advances, computer-based simulation games have become more authentic. These new higher levels of fidelity and verisimilitude have allowed learners to become more immersed in the simulated 'microworlds' of the games; hence, critical incidents that occur within the gaming period are felt in an impactful way that is closer to a real world experience. However, whilst critical incidents may feel real and can generate emotional reactions, they do not have negative consequences for the players themselves or for any real organisations; in other words, simulations provide a safe environment for learning through critical incidents.

Although SGs are increasingly achieving a high level of authenticity, they are by definition 'simplifications of reality' and do still work at a level of abstraction relative to the real world. In a real world situation, marked by problems that are ill-defined, amorphous, messy and complex, it is often difficult to identify a critical incident, never mind understand its nature, in terms of cause, course and results. In contrast, because computer based SGs are more rigid (i.e. they comprise of structure, rules and behaviour) and more simplified than real world circumstances, it is easier to identify and separate out different impacting variables and events within the boundaries of a game. With fewer variables than in the real world for the students' to consider, it is easier for them to actually trace through and establish the causal influences that are contributing to a course of action and its resultant outcomes; thus making critical incidents more explicit. This is assisted greatly within simulations by the outputs or performance results generated automatically after each playing period

of a game. Within some SGs, critical incidents are either pre-determined (pre-programmed) or the instructor has the opportunity, pre-play, to introduce them (unknown to the player) at key points during game play. In a number of games, there is a facility for instructors to flag these interventions to aid the learners' recognition of critical incidents, for example *Airline: A Strategic Management Simulation* (Smith and Golden, 2008), *Human Resources Management Simulation* (Smith and Golden, 2005) and *Corporation: A Global Business Simulation* (2003). This explicit flagging and signposting of critical incidents can aid learning that may not be readily apparent in the real world.

Given the benefits that online SGs offer (in terms of authenticity and an ability to manipulate time), they provide a potentially powerful mechanism for students to discover and learn about the nature of decision making through experiencing and reflecting upon critical incidents in a safe, risk-free and experimental learning environment. Through combining online simulations with a critical incident method, it is postulated that the impact of this form of e-learning can be increased.

Methodological Approach

The approach adopted in this study was to develop a case study of practice to describe a learning and assessment approach that utilises a critical incident method within the context of a business simulation game. The case study draws on educational practice to facilitate reflection aimed at enhanced teaching and learning delivery. Hence, the approach used aligns with an *action research* approach. The concept of reflective self-study of practice by educators through action research is well established in the literature (Stenhouse, 1975; Car & Kemmis, 1986; Whitehead, 1985). The implementation of action research typically follows a cyclical process involving planning an action, implementing the action, monitoring and finally reflecting on the action (see, for example, Elliott, 1991; Kemmis and McTaggart, 1982; McKernan, 1988). Whilst the use of critical incident debriefing within action research studies is well established in real world or non-simulated world settings (see for example Joyce, 1999; Keating, 2002), in this study, the action centred on the planning and implementation of a new approach to the practice of teaching with simulation games. This involved adopting a blended learning approach through embedding a critical incident method within the learning activity. The section below describes the blended learning approach adopted and the following section reflects on the initial outcomes of the changes to practice.

Case Study: A Blended Learning and Assessment Approach to Using a Critical Incident Method in a Simulation Game

Within Plymouth University Business School, part-time, post-graduate / post-experience students are taught strategic management as a capstone module of study, dovetailing the various strands of business and management. As part of an effort to make the subject more engaging and relevant to their current and future work organisations, simulation gaming has been used for a number of years as an experiential learning approach. *The Business Strategy Game* (Thompson *et al*, 2010) was selected as an off-the-shelf total enterprise simulation game that could help address the teaching, learning and assessment imperatives of the subject module.

The *Business Strategy Game* (BSG) is a web-based with 24-7 student and instructor access. It simulates the strategies and decisions of companies serving the global marketplace for athletic footwear. Student teams (companies) adopt the roles of Directors and compete against other teams for a predetermined market demand. An instructor is responsible for overseeing the running of the game and can shape many of the externalities that will govern company decision-making (such as exchange rates, material prices and shipping costs). The game requires the input of yearly business decisions, such as volumes of goods to manufacture, shipment volumes, pricing levels and advertising spend. These decisions are collectively processed on an on-line server program, and the game then rolls on to another year's play. Performance data is generated allowing students to see the effects of their decisions. Scores based on a number of performance metrics (for example, profit, market share, capitalisation, sales volume) are determined, resulting in the teams moving up or down a league table of companies.

Given the wide managerial experience of this particular student cohort, the totality of the BSG environment does provide resonance and correspondence with their real workplace setting, allowing them to not only draw on theory, but their own management practice to inform how they strategise for and operate their simulated companies. As identified by Wall and Ahmed (2008), a blended learning approach that integrates theory and practice through a simulation aligns well with the needs of learners undertaking professional development. Existing management experience can result in the levels of engagement and understanding of the game dynamics being higher than might be expected among learners with little or no managerial experience. Consequently, this does provide good opportunities to extend the real world feel of simulation based learning by employing more innovative methods to assess the knowledge and understanding developed through playing the BSG.

Incidents or events that unfold during the course of playing the BSG are presented as opportunities for critical reflection. Throughout the course of play, the student teams are confronted by significant events which provide learning opportunities. Such events are not routine, rather critical. Consequently, they help students, through reflection, to develop high-order skills. In designing the summative assessment of the simulation gaming exercise, what was required was a method that was based on reflection and would enable students to identify and discuss, post-game, the critical incidents that occurred during play. It was decided that a form of debriefing activity would allow critical reflection to occur.

Reflection can play an important part in constructing knowledge and improving learning (Chen et al, 2011). A number of authors emphasise using critical reflection or debriefing as an important element of learning with SGs (Garris, Ahlers, and Driskell, 2002; Gredler, 2002; Lean and Moizer, 2010). In-game, students may play without actually reflecting on decision and events, hence the importance for them to be aware of reflection and how it can be facilitated (Lee and Chen, 2008). Post-game, getting students to reflect on the knowledge gained holistically from playing a SG, and how the various strands of information fit together can help promote deeper learning. Knotts and Keys (1997) recognise that students learn at various points during a simulated gaming period. They specifically argue that learning occurs when students are forced to reflect on their experiences, as the experience itself will not

provide learning alone. Students need to understand how they can learn from experiences tested against espoused theories. This process of reflection can be facilitated through debriefing, where learning closure can take place. End of game debriefing can crystallise or integrate the learning events that occurred during play (Léger et al, 2011). Debriefing is a form of instructional support that acts as scaffolding to help provide for an effective learning environment (Garris et al, 2002). It provides the means by which the game itself can be linked to the achievement of learning outcomes. It allows the opportunity to review and analyse the events that occurred during game play, allowing argumentation to be developed and assessed (Sutcliffe, 2002).

For this student cohort and module, a blended approach was adopted, combining online simulation and post-simulation oral debriefing. Oral debriefing conducted in-role can be extremely valuable, as it allows the realism of the experience to be extended. In this situation, the gaming participants are still thinking and acting as decision-makers, and thus, they are able to reflect more easily on the past, present and future direction of their company. Oral debriefings are commonly used, post-game, to guide students through a reflective process of their learning, where students and instructors engage in a question and answer type session (Petranek et al, 1992).

Post-game, oral debriefing was particularly suited to this cohort of students given their managerial backgrounds, work experience and confidence in engaging in verbal discourse. The debriefing was used to measure the extent to which student participants learnt about managing their company's strategy and operations within the BSG. The debriefing took the form of a role play discussion, with each student team (Company Directors) over a period of 20 to 30 minutes. This discussion was summatively assessed and contributed to 30% of the overall module grade. Prior to the debriefing, the teams prepared by producing a short formative report, incorporating relevant information, models and graphics that would clarify their understanding of key events and performance as well as provide the instructors with the necessary evidence to shape a full discussion.

Within the debriefing discussions, the teams remained in-role as company directors and two instructors took on the parts of corporate investors seeking potential investment opportunities with each company. A scripted role-play was employed to structure the verbal interactions to ensure that the discussion addressed the assessment criteria and intended learning outcomes of the simulation gaming exercise. A discussion of critical incidents experienced during play featured as a key component of the debriefing activity.

Flanagan's technique was adapted and simplified in order to provide reflective insight at the post-game debriefing stage into a series of events or incidents that the students faced at certain points along the gaming timeframe. The students were advised that a critical incident in the context of the game play was an event which made them think differently than before about aspects of their simulated business and its operating environment.

As part of the debriefing process, students were prompted to look back and reflect on the game play and to explore critical incidents (both positive and negative) which

may have impacted on their understanding of business strategy and the running of their simulated company. They shared with the instructors up to three critical incidents (occurring at the company, industry and macro-environmental levels). They were asked to frame incidents in terms of cause, course and result (as per the Edvardsson and Roos, (2001) interview guide method for critical incident capture).

Hence, the surfacing of critical incidents centred on three questions:

1. What happened in the critical incident? - CAUSE
2. How did your strategic thinking change as a result of this event? - COURSE
3. What strategic actions followed on from this event (behaviour)? - RESULT

Reflections on Practice

Preliminary evaluation of the critical incident method adopted has been based primarily on initial feedback from instructors and students involved. This feedback indicates that students using the simulation were able to frame and reflect upon incidents effectively. In other words, the student teams were able, post-game, to identify critical incidents and make meaning of them from a strategic perspective, enabling them to evaluate the decisions made and actions taken during the course of the game. In many instances, students were able to identify mistakes made and were able to think through alternative courses of action that may have resulted in improved performance. It was evident that by focusing the debriefing on critical incidents, participants were able to see more clearly the relationship between events, decisions and the performance of their simulated firms. This is borne out by good grade performance across the student cohort and indicates that an emphasis on critical incidents within the assessment of the gaming experience has brought about an enhanced level of reflection, allowing more comprehensive and insightful oral debriefings to take place.

The promising outcomes of initial attempts to utilise a critical incident methods in the context of simulation gaming have led to the approach becoming embedded in teaching practice within the module in question. Further research is being undertaken to collect empirical evidence to facilitate a fuller evaluation of the effects of this approach on student learning.

Conclusion

The bodies of literature on both simulation games and on the critical incident method highlight the learning benefits of each approach. Through presenting a case study of practice, this paper has attempted to show how, by combining both approaches, there is considerable potential for promoting an even higher level of understanding amongst students. The current study is limited in that a full evaluation of the learning impact of the blended approach is lacking. Future research will attempt to map learning against a critical incident framework in order to systematically assess students' ability to reflect meaningfully on their simulation activity. Whilst the added learning impact of the method described in this paper is difficult to measure, by considering the relationship between student perceptions of critical incidents and the metrics captured by the simulation software, a qualitative assessment of student learning may be achieved. Preliminary evidence from this case study indicates that

the blended learning method employed does allow students to learn from critical incidents in a way that would be hard to achieve in a real world setting. Furthermore, the critical incident method provides educators with a structured and focused framework that has the potential to facilitate deep student reflection on their experiences of participating in an online simulation game.

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